

Digenetic Trematodes of Marine Fishes from the Kuwaiti Coast of the Arabian Gulf: Family Monorchiidae Odhner, 1911

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ABSTRACT: Two species of monorchiids are described from marine fishes of the Kuwaiti coast of the Arabian Gulf: *Proctotrematoides kuwaiti* sp. n. from *Synaptura orientalis* and *Pseudorhombus arsius* differs from all others in the genus by the absence of a prepharynx and esophagus and by the arrangement and position of the vitelline follicles. *Opisthodioplomonorchis elongatus* Madhavi, 1974, is reported from *Polydactylus sextarius* and *Plectorhynchus* sp., both new locality records and the latter a new host record. *Opisthodioplomonorchis* differs from all monorchiid genera with diagonal or tandem testes by the following combination of characteristics: vitellaria in 2 lateral groups of pre- and postovarian follicles, multilobed ovary, tandem testes at the posterior extremity, and unipartite seminal vesicle and terminal organ. Keys to the species of *Proctotrematoides* and monorchiids with 2 testes are included. *Pseudomonorcheides* Zhukov, 1983, nec *Pseudomonorcheides* Wang, 1982, is renamed *Zhukovirema*.

KEY WORDS: digenetic trematodes, Monorchiidae, *Proctotrematoides*, *Opisthodioplomonorchis*, *Zhukovirema*, marine fishes, *Synaptura orientalis*, *Pseudorhombus arsius*, *Polydactylus sextarius*, *Plectorhynchus* sp., Arabian Gulf, Kuwait.

During the course of a survey of helminth parasites of Kuwaiti coast fishes carried out by the first author between October 1992 and December 1995, a collection of digenetic trematodes was obtained that included several species of monorchiids, 2 of which are described in this paper. Four previous reports on adult digenea from the Kuwaiti coast have been published (see Al-Yamani and Nahhas, 1981; Abdul-Salam and Khalil, 1987; Abdul-Salam et al., 1990; Abdul-Salam and Sreelatha, 1993). No monorchiids were reported in any of these studies. Monorchiids have been recorded, however, from fishes of other parts of the Arabian Gulf. Saoud et al. (1986, 1988) listed 3 species from Qatari and adjacent waters: *Monorcheides* sp. from *Gnathodon speciosus*, *Proctotrema* sp. from *Liza macrolepis* and *Velamugil seheli*, and *Paraproctotrema qatarensis* from *Plectorhynchus pictus*; El-Naffar et al. (1992) listed *Lasiotocus* sp. from *Plectorhynchus cinctus* from the United Arab Emirates.

Materials and Methods

Ten oriental soles, *Synaptura orientalis* (Bloch and Schneider, 1801) (family Soleidae), 33 large-toothed flounders, *Pseudorhombus arsius* (Hamilton and Buchanan, 1822) (family Bothidae), 4 6-threads thread-fins, *Polydactylus sextarius* (Bloch and Schneider,

1801) (Polynemidae), and 4 of an unidentified grunt, *Plectorhynchus* sp. (family Pomadasidae), obtained from the local fish market, were examined and found to harbor monorchiids. The digeneans were washed in saline, fixed in cold AFA under slight coverglass pressure, rinsed in 70% ethanol, stained with alum carmine, destained in diluted HCl, dehydrated in ascending concentrations of ethanol, cleared in clove oil, and mounted in Canada balsam.

All measurements are expressed in micrometers, with the range followed by measurements of the holotype in parentheses. Sucker ratio was calculated from the mean of the length and the width and is expressed with the oral sucker taken as 1. Drawings of the adult worms were prepared by microprojection and details filled in through microscopic observations; those of the terminal reproductive structures are free-hand sketches. Prevalence, mean intensity, abundance, and collection dates are listed in Table 1.

The holotype is deposited in the National Reference Collection (NRC), Department of Zoology, Kuwait University, with vouchers in the United States National Parasite Collection (USNPC), Beltsville, Maryland, and the Natural History Museum BM(NH), London. Fishes were identified using Kuroshima and Abe (1972).

Results

Proctotrematoides kuwaiti sp. n.

(Figs. 1, 2)

DESCRIPTION (based on 15 gravid and 2 immature specimens): Body 1,350–2,100 (2,045) long by 425–525 (523) wide at acetabular level, rounded at both ends. Cuticle spinose, spines extending to level of posterior margin of ventral

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Table 1. Monorchiids found in 4 species of marine fish from Kuwait.

Host Monorchiid	% prevalence	Mean intensity	Abundance	Collection dates
<i>Synaptura orientalis</i>				
<i>Proctotrematoides kuwaiti</i>	30	10.0	3.00	5 February 1994 3 March 1995 28 March 1995
<i>Pseudorhombus arsius</i>				
<i>Proctotrematoides kuwaiti</i>	9	4.6	0.40	26 April 1995 18 October 1995 10 November 1995
<i>Polydactylus sextarius</i>				
<i>Opisthodiplomonorchis elongatus</i>	50	4.5	2.20	15 October 1993 5 October 1995
<i>Plectorhynchus</i> sp.				
<i>Opisthodiplomonorchis elongatus</i>	25	3.5	0.75	29 July 1993

sucker becoming sparse posteriorly. Eye spot pigments lateral to pharynx, often diffuse, difficult to observe in some specimens. Oral sucker cup-shaped, subterminal, 150–205 (200) long by 150–250 (220) wide, with weakly developed postoral circular muscle. Ventral sucker globular 125–200 (165) in diameter, slightly anterior to midbody. Sucker ratio 1:0.80–1.00 (1:0.82). Prepharynx absent; pharynx transversely elongate, 80–150 (135) long by 125–200 (170) wide; esophagus absent; cecal bifurcation 300–350 (318) anterior to ventral sucker; ceca wide, thick-walled, extending to near posterior extremity. Testis single, smooth, 180–340 (340) long by 200–325 (318) wide, median, equatorial or slightly postequatorial. Cirrus sac thick-walled, 275–450 (450) by 60–170 (170) at base, dextral, extending posteriorly to near midovarian level or ovario-testicular junction, containing internal spherical seminal vesicle 125–138 (138) in diameter, short prostatic duct and long spiny cirrus, 110–250 (205) long by 25–35 (30) wide, spines measuring 10–15 in length; prostate cells numerous, surrounding part of anterior region of seminal vesicle, all of prostatic duct and part of cirrus. Ovary smooth, 100–148 (148) in diameter, dextral, submedian, sometimes overlapping right cecum and often contiguous with anterior level of testis. Vitellaria 8–10 follicles (8 on right, 10 on left), relatively large, mostly extra-cecal, extending in 2 longitudinal columns from near level of intestinal bifurcation to anterior level of ovary; vitelline ducts entering vitelline reservoir dorsally at ovario-testicular junction.

Seminal receptacle absent; proximal part of uterus serving as long, often sinuous, uterine seminal receptacle; Laurer's canal not seen; uterine coils extending posteriorly filling practically all posttesticular space, overlapping ceca laterally, entering bipartite terminal organ near junction of its anterior and posterior parts. Terminal organ thick-walled, sinistral, intercecal, one-half to two-thirds length of cirrus sac; its posterior part containing spherical vesicle, same size as or slightly smaller than seminal vesicle, with long needle-like spines and gland cells; its anterior part containing fewer and smaller spines. Genital atrium consisting of thick spiny posterior part, into which metraterm and cirrus open, and anterior shallow thin-walled part; genital pore median to submedian, about midway between ventral sucker and intestinal bifurcation. Eggs numerous, operculated, 25–30 by 16–20; eggs not seen in posterior part of terminal organ. Excretory vesicle slender, thin-walled, extending to near intestinal bifurcation.

HOSTS: *Synaptura orientalis* (Bloch and Schneider) (Soleidae) (type host); *Pseudorhombus arsius* (Hamilton and Buchanan) (Bothidae).

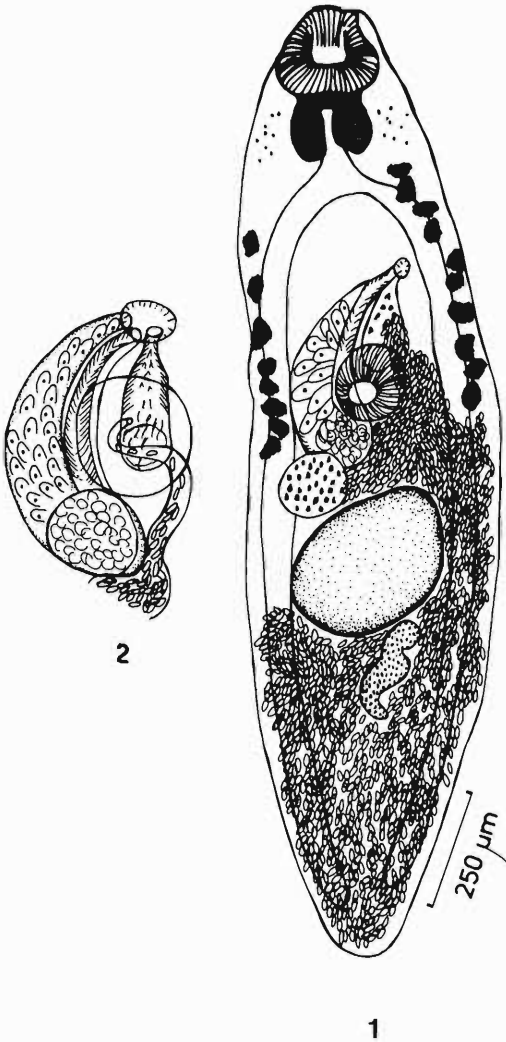
SITE: Intestine.

HOLOTYPE: NRC No. 14 (Kuwait University).

PARATYPES: USNPC No. 86780; BM(NH) No. 1996.7.26.1.

ETYMOLOGY: The species is named after the State of Kuwait.

REMARKS: These specimens were referred to the genus *Proctotrematoides* on the basis of the



Figures 1, 2. *Proctotrematoides kuwaiti* sp. n. from *Synaptura orientalis*. 1. Holotype, ventral view. 2. Terminal parts of male and female reproductive structures, sketch.

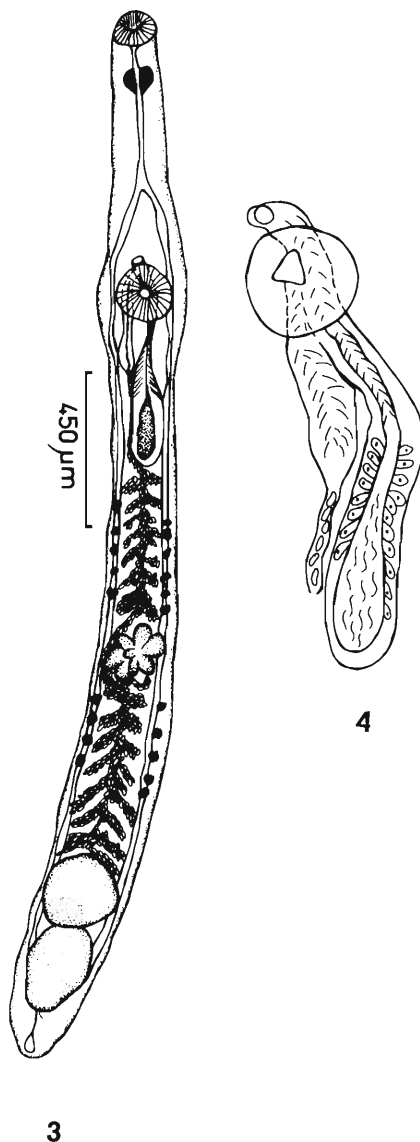
terminal parts of the male and female reproductive organs including spines in the cirrus, metratrum and genital atrium, a spherical ovary, distribution of the vitellaria, and a long excretory vesicle that extends to near the intestinal bifurcation. This triple spination of the terminal reproductive structures is also characteristic of the genus *Genolopa* Linton, 1910. *Proctotrematoides* was named by Yamaguti (1938) for *P. pisodontophidis* to describe several specimens recovered from the intestine of *Pisodontophis cancrivora* from the Inland Sea of Japan. He distin-

guished *Proctotrematoides* from *Proctotrema* and *Paraproctotrema* by the character of the ovary (entire), the vitellaria (follicular, extending from the anterior level of the ventral sucker to the level of posterior end of testes), the possession of a muscular spiny atrial pouch, bipartite terminal organ with the uterus entering it at its spiny anterior part, and a long tubular excretory vesicle extending to near intestinal bifurcation. Manter (1942), characterizing *Genolopa* as having spines in the cirrus, also the anterior part of the terminal organ and the genital atrium, considered *Proctotrematoides* a synonym. Thomas (1959) accepted *Proctotrematoides* on the basis of an atrial diverticle and presence of a long tubular excretory vesicle. Yamaguti (1971), characterizing the 2 genera, incorrectly stated that a seminal receptacle is present in *Genolopa* but absent in *Proctotrematoides*. Such a structure is lacking in both. In their review of the family Monorchiidae, Manter and Pritchard (1961) accepted, with reluctance, Thomas's recommendation pointing to the probable variability of an atrial diverticle. We agree with Manter and Pritchard that this structure is unreliable as a generic characteristic; and atrial diverticle was difficult to observe in a few of our specimens. It was equally difficult, sometimes, to determine whether spines in the genital atrium were those of the atrium itself or the extended spiny cirrus.

When the type species of *Genolopa* and *Proctotrematoides* are considered, the chief differences between them are the distribution of the vitellaria and the length of the excretory vesicle. In *Genolopa*, the vitellaria consist of few follicles, usually in 2 clusters, 1 on each side near the ovarian zone, and the excretory vesicle is a short sac-like structure restricted to the posterior end of the body. In *Proctotrematoides*, the vitelline follicles extend longitudinally in lateral fields between the ventral sucker and the testes, and the excretory vesicle is a long tube extending to near the intestinal bifurcation. Both genera share the common characteristics of a cirrus sac containing a unipartite seminal vesicle, a distinct prostatic duct, a spiny cirrus, and a bipartite terminal organ that is entered by the uterus at some point between its spiny anterior portion and its aspinose posterior part. Not all species included in the 2 genera meet these criteria. Equally confusing is the relationship of *Proctotrematoides* and *Genolopa* to *Proctotrema*, *Paraproctotrema*, and *Lasiotocus* (see Thomas,

1959; Manter and Pritchard, 1961; Durio and Manter, 1968; Yamaguti, 1971). More than 60 species have been described in the 5 genera; many show overlapping generic characteristics, and several lack information essential for generic characterization. Some of the species in *Proctotrematoides* are also an example of this confusion, as evident in the discussion that follows.

In addition to the type species *P. pisodontophidis* Yamaguti, 1938, 7 others have been referred to this genus: *P. ophichthi* Fischthal and Thomas, 1969, from *Ophichthus* (*Pisodontophis*) *semicinctus* (Ophichthyidae) from Ghana; *P. stromateusi* Gupta and Ahmad, 1976, from *Stromateus cinereus* (Stromateidae) from the Puri Coast, Orissa, Bay of Bengal; *P. diacanthi* Zaidi and Khan, 1977, from *Epinephelus diacanthus* (Serranidae) from the Arabian Sea; *P. thapari* Ahmad, 1980, from *Stromateus cinereus* from the Arabian Sea, off the Bombay coast; *P. indicum* Ahmad and Gupta, 1985, from *S. cinereus* from the Puri coast, Orissa, Bay of Bengal; *P. gymnothoraci* Shen, 1990, from *Gymnothorax* sp. (Muraeinidae) from Hainan Island, China; and the new species *P. kuwaiti* from *Synaptura orientalis* (Soleidae) and *Pseudorhombus arsius* (Bothidae) from the Kuwaiti coast of the Arabian Gulf. *Proctotrematoides stromateusi* and *P. thapari* are mentioned in abstracts (see Gupta and Ahmad, 1976; Ahmad, 1980) but were never followed by a complete description, at least under these names. *Proctotrematoides stromateusi* was recovered from the same host species and locality as *P. indicum* Ahmad and Gupta, 1985, and is probably a synonym. *Proctotrematoides indicum* has a 3-lobed ovary and its excretory vesicle extends only to the anterior level of the testis but shares all other characteristics of *Proctotrematoides*. *Proctotrematoides diacanthi* Zaidi and Khan, 1977 is inadequately described and its figure does not show clearly the male and female terminal reproductive structures; it shows, however, a long tubular excretory vesicle and vitelline distribution characteristic of *Proctotrematoides*. For the time being, these species are retained in *Proctotrematoides* until the original material or new specimens are studied and the taxonomic problems associated with the 5 genera are resolved. We have been unable to obtain the literature on *P. gymnothoraci* Shen, 1990, but an anonymous reviewer of this manuscript suggested it was probably incorrectly assigned to the genus.



Figures 3, 4. *Opisthodioplomonorchis elongatus* Madhavi, 1974, from *Polydactylus sextarius*. 1. Dorsal view. 2. Terminal parts of male and female reproductive structures, sketch.

Based on a review of the literature, a key to 5 species of *Proctotrematoides* is proposed.

***Opisthodioplomonorchis elongatus*
Madhavi, 1974
(Figs. 3, 4)**

REDESCRIPTION (based on 12 specimens):
Body elongated, 1,910–3,650 long by 180–250

in greatest width at level midway between ovary and anterior testis. Forebody 410–780; hindbody 1,400–2,275. Cuticle spinose, spines extending to level of ovary becoming sparse posteriorly. Eye spot pigments absent. Oral sucker terminal, 55–100 long by 67–110 wide. Ventral sucker spherical, 100–180 in diameter, near junction of anterior and midbody thirds. Sucker ratio 1:1.3–1.6. Prepharynx about same length as pharynx; pharynx 40–58 long by 40–63 wide; esophagus 4–5.5 times the length of pharynx; cecal bifurcation about two-thirds distance from pharynx to ventral sucker; ceca narrow, extending to posterior end of posterior testis. Testes smooth or slightly irregular, subequal, tandem, contiguous, in posterior fifth of body; anterior testis 120–210 long by 130–220 wide; posterior testis 150–240 long by 80–180 wide. Cirrus sac dextral, 440–675 long by 53–90 in greatest width, extending posteriorly almost half-way between ventral sucker and ovary, containing ovoid seminal vesicle in posterior third of cirrus, prostatic duct in midthird, surrounded by prostate cells, and spiny cirrus in anterior third, spines 7–12 in length. Ovary consisting of 7–10 lobes, 135–230 long by 135–250 wide in posterior half of body about midway between posterior end of cirrus sac and anterior testis. Seminal receptacle lacking. Laurer's canal not seen. Uterine coils winding from side to side in space between anterior testis and ovary, and between ovary and posterior tip of cirrus sac, joining spiny terminal organ at its posterior end; terminal organ unipartite, spiny, spines 7–10 in length. Vitelline follicles in 2 lateral groups of 4–6 follicles each, anterior and posterior to ovary; in a few specimens 1 or 2 follicles are seen lateral to the ovary. Genital atrium shallow, aspinose, median, anterior to ventral sucker; genital pore immediately preacetabular, median or slightly submedian. Eggs operculated, without filament, 12–17 by 8–13. Excretory vesicle tubular extending anteriorly to midlevel of ventral sucker.

HOSTS: *Polydactylus sextarius* (Bloch and Schneider) (Polynemidae); *Plectorhynchus* sp. (Pomadasyidae).

SITE: Intestine.

DEPOSITED SPECIMEN: NRC No. 15 (Kuwait University); USNPC No. 86781; BM(NH) No. 1996.7.26.2.

REMARKS: Madhavi (1974) described this species from the intestine of *Psettodes erumei* (Bloch) (Psettodidae) (type host) and *Polynemus*

(*Polydactylus*) *sextarius* Bloch (Polynemidae) from the Waltair coast, Bay of Bengal. Our re-description adds little to Madhavi's original account. Our specimens are somewhat smaller and narrower (1,910–3,650 by 180–250 compared to 3,340–4,800 by 314–320); all other measurements overlap. She described the ovary as multilobed; ours have 7–10 lobes. Madhavi did not describe the excretory vesicle; our specimens show a tubular structure extending anteriorly to midlevel of the ventral sucker.

Twenty-two genera of monorchiids with 2 testes are known to date: 8 with symmetrical testes (*Monorcheides* Odhner, 1905; *Paramonorcheides* Yamaguti, 1938; *Diplomonorchis* Hopkins, 1941; *Paleorchis* Szidat, 1943; *Diplomonorchis* Thomas, 1959; *Hysterorchis* Durio and Manter, 1968; *Pseudomonorcheides* Wang, 1982, nec *Pseudomonorcheides* Zhukov, 1983; and *Pseudomonorcheides* Zhukov, 1983, nec *Pseudomonorcheides* Wang, 1982) and 14 with diagonal or tandem testes (*Ancylocoelium* Nicoll, 1912; *Physochoerus* (Rud., 1819) Poche, 1926; *Triganodistomum* Simer, 1926; *Postmonorcheides* Szidat, 1950; *Diplolasiotocus* Yamaguti, 1952; *Cestrahelminis* Fischthal, 1957; *Diplohurleytrema* Nahhas and Cable, 1964; *Timonia* Bartoli and Prévot, 1966; *Paratimonia* Prévot and Bartoli, 1967; *Pseudopaleorchis* Kamagai, 1970; *Neopaleorchis* Schell, 1973; *Opiethodiplomonorchis* Madhavi, 1974; *Anapaleorchis* Fujio and Kifune, 1991; and *Neolasiotocus* Ahmad, 1991).

Thomas (1959) included *Achoerus* Wlasenko, 1931, undoubtedly by mistake, in this group. Szidat (1950) considered *Monorcheides* and *Paramonorcheides* synonyms. Manter and Pritchard (1961, p. 483) regarded *Triganodistomum* as "a close relative, if not a synonym of *Lissorichis* Magath, 1916 (Family Lissorchiidae)." Overstreet (1969) synonymized *Diplomonorchis* with *Diplomonorchis*. *Pseudomonorcheides* Zhukov, 1983, is preoccupied; therefore, a new name, *Zhukovtrema*, is proposed.

Based on a review of the literature, a key is presented to distinguish among 21 of the 22 genera (*Physochoerus* is excluded because of limited and inadequate information).

Zhukov (1983) gave the following diagnosis of his genus (translated from Russian).

Zhukovtrema gen. n.

GENERIC DIAGNOSIS: Monorchiidae, Monorchiinae. Body ovoid. Cuticle spinose. Oral suck-

er subterminal. Prepharynx absent or very short; pharynx muscular; esophagus short, bifurcating at the junction of anterior and midbody third; ceca not reaching posterior end of body. Ventral sucker posterior to midbody. Testes 2, elongated, symmetrical, mostly in posterior half of body. Cirrus sac with internal seminal vesicle and spiny cirrus, anterolateral and dextral to acetabulum. Ovary 3-lobed, anterior to right testis; seminal receptacle absent; terminal organ (Looss organ) bipartite, anterior part spiny, posterior part muscular; uterus extensive, coils extending posteriorly and occupying space between testes and anteriorly on both sides surrounding oral sucker and pharynx; Vitellaria in 2 symmetrical groups of 6–8 large follicles each in midbody at the level of the gonads and overlapping ceca. Genital pore about midway between ventral sucker and intestinal bifurcation. Eggs small. Excretory vesicle (?); uterus joining terminal organ (?). Parasite of marine fish.

SYNONYM: *Pseudomonorcheides* Zhukov, 1983, nec *Pseudomonorcheides* Wang, 1982. Type species *Z. caballeroi* (Zhukov, 1983) in *Syacium* sp., Bay of Campeche, Gulf of Mexico.

Key to Species of *Proctotrematoides*

- 1a. Esophagus at least twice the length of the pharynx 2
- 1b. Esophagus shorter than pharynx or absent 3
- 2a. Ovary entire; seminal vesicle small, spherical, occupying base of cirrus sac *P. pisodontophidis*
- 2b. Ovary trilobed; seminal vesicle cylindrical occupying three-fourths the length of cirrus sac *P. indicum*
- 3a. Vitelline follicles relatively small and numerous, extending from level of posterior end of cirrus sac some distance posterior to testis *P. ophichthi*
- 3b. Vitelline follicles 8–10 on each side, extending from anterior level of acetabulum to gonads 4
- 4a. Prepharynx as long as pharynx; esophagus absent; vitelline follicles extending from anterior level of genital atrium to testicular level *P. diacanthi*
- 4b. Prepharynx and esophagus absent; vitelline follicles extending from level of intestinal bifurcation to ovario-testicular level *P. kuwaiti*
- 2b. Testes diagonal or tandem; ovary entire or lobed 3
- 3a. Ovary entire; esophagus 40–60% of body length, with cuticular lining anteriorly, epithelial posteriorly; ceca not extending posterior to ovary *Pseudopaleorchis*
- 3b. Ovary lobed; esophagus short or moderately long, without cuticular lining; ceca extending beyond ovary 4
- 4a. Ceca reaching to near posterior extremity; vitellaria extending laterally from level of cirrus sac to level of posterior testis *Triganodistomum*
- 4b. Ceca extending to anterior level of posterior testis; vitellaria not extensive 5
- 5a. Vitellaria in 2 lateral compact clusters in the acetabulo-ovarian zone *Anapaleorchis*
- 5b. Vitellaria mainly postcecal, confluent dorsal to testes *Neopaleorchis*
- 6a. Testes symmetrical or subsymmetrical 7
- 6b. Testes tandem or oblique 13
- 7a. Ovary entire; terminal organ bipartite, with a sphincter near its anterior end, joined by uterus just posterior to sphincter; cirrus sac chiefly postacetabular *Diplomonorcheides*
- 7b. Ovary lobed, rarely entire; terminal organ unipartite or bipartite; cirrus sac variable in extent in relation to ventral sucker 8
- 8a. Body usually elongate 9
- 8b. Body ovoid or pyriform 10
- 9a. Testes elongate, near posterior end of body; seminal vesicle bipartite, terminal organ cylindrical, unipartite, unspined, joined by uterus at its posterior end; vitellaria extensive, extending from midesophageal level to anterior level of testes; eggs with filament *Hysterorchis*
- 9b. Testes elongate, chiefly in midbody third; seminal vesicle saccular; terminal organ with a sphincter, joined by uterus at its anterior end just below sphincter; vitellaria in lateral fields extending from intestinal bifurcation to near anterior level of testes; eggs without filament *Paramonorcheides*
- 10a. Ceca short not reaching testicular level; testes spherical, in midbody third; vitellaria in 2 lateral clusters of 6–7 follicles each in pharyngeal region *Pseudomonorcheides*
- 10b. Ceca extending posteriorly to testes or beyond; vitellaria not reaching pharynx 11
- 11a. Body ovoid, almost spherical; ventral sucker at or slightly posterior to midbody; uterus extending anteriorly and laterally to oral sucker *Zhukovtrema*
- 11b. Body pyriform; ventral sucker anterior to midbody; uterus not extending to oral sucker 12
- 12a. Testes elongate, chiefly in posterior body third; vitellaria in 2 clusters of few follicles each between cecal bifurcation and anterior level of ovary; terminal organ unipartite, spiny, joined by uterus at its posterior end *Monorcheides*

Key to Genera of Monorchiidae with Two Testes

- 1a. Genital pore marginal or submarginal 2
- 1b. Genital pore median or submedian 6
- 2a. Testes symmetrical or subsymmetrical; ovary entire *Paleorchis*

- 12b. Testes ovoid, near midbody; vitelline follicles chiefly in gonadal zone *Diplomonorchis*
- 13a. Ceca short, not reaching ventral sucker, M-shaped or inverted V *Ancylocoelium*
- 13b. Ceca long, extending posterior to ventral sucker 14
- 14a. Eggs with filament; seminal vesicle bipartite; terminal organ unipartite 15
- 14b. Eggs without filament; seminal vesicle bipartite or unipartite; terminal organ bipartite or unipartite 16
- 15a. Esophagus 2–4 times length of pharynx; ventral sucker at junction of anterior and midbody thirds; seminal receptacle present *Diplohurleytrema*
- 15b. Esophagus 8–10 times length of pharynx; ventral sucker in midbody; no seminal receptacle *Diplolasioticus*
- 16a. Testes tandem 17
- 16b. Testes diagonal 18
- 17a. Testes at posterior extremity; terminal organ spiny, unipartite, joined by uterus at its base; vitellaria in 2 lateral groups anterior and posterior to multilobed ovary *Opisthodiplomonorchis*
- 17b. Testes removed from posterior extremity by some distance; terminal organ bipartite, joined by uterus at junction of aspinose posterior part and anterior spiny metraterm *Neolasitocus*
- 18a. Terminal organ unipartite 19
- 18b. Terminal organ bipartite 20
- 19a. Body ovoid to linguiform; esophagus short or absent; testes juxtaposed, overlapping in median line, near posterior end of body; uterus not extending posterior to testes *Postmonorcheides*
- 19b. Body enlarged anteriorly, spoon-shaped; esophagus very long, almost 30% of body length; testes contiguous but not overlapping, in midbody third; uterus extending to posterior end of body *Cestrahelminis*
- 20a. Ovary trilobed; vitellaria as 2 compact, intercecal masses, one anterior to ovary, the other to anterior testis *Paratimonia*
- 20b. Ovary entire; vitellaria in 2 clusters of 9 follicles each, overlapping ceca and extending between posterior end of cirrus sac and level of anterior testis *Timonia*

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